

## 12.4 Soil Contamination Sites

### 12.4.1 CFA-633 Naval Firing Site and Downrange Area

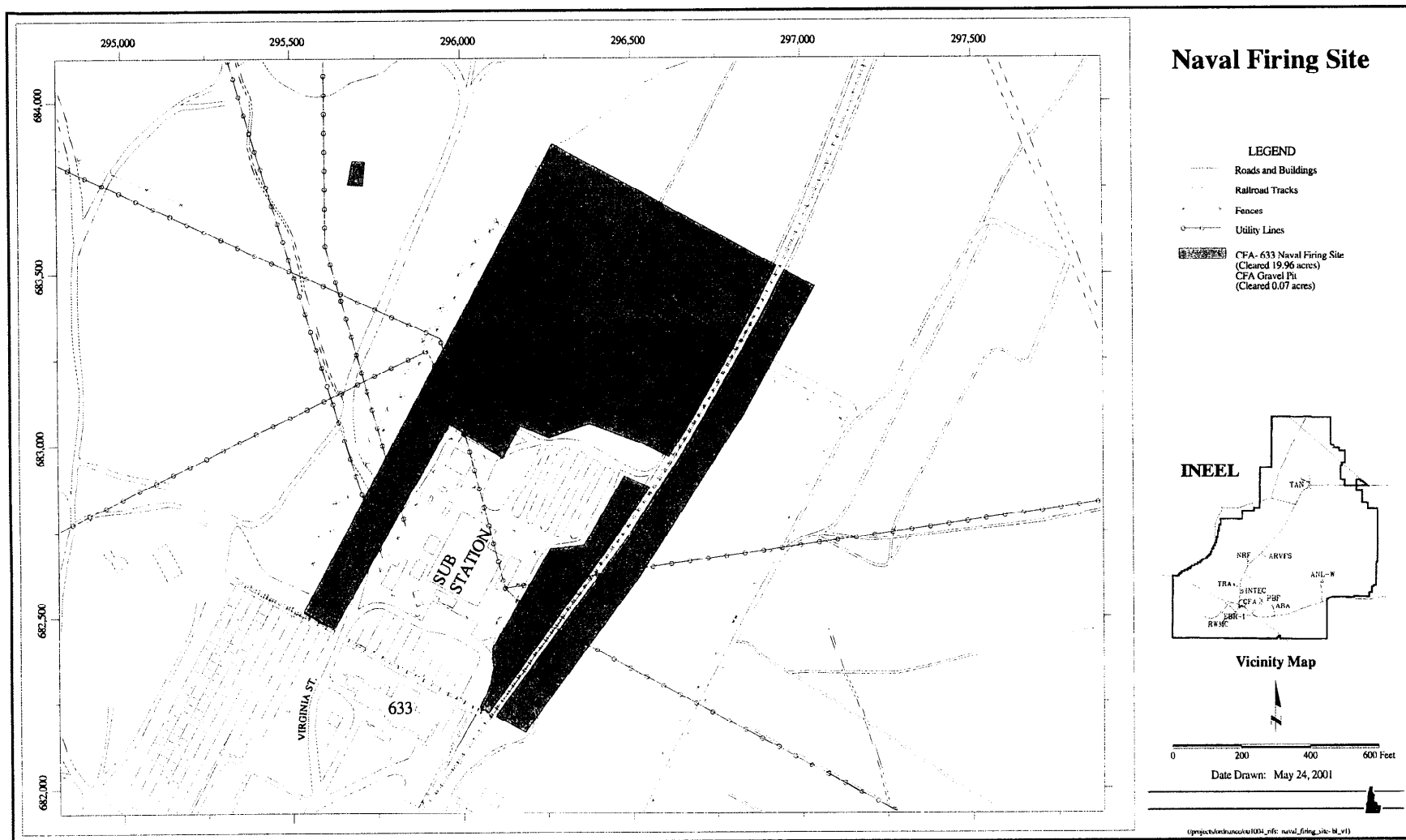
**12.4.1.1 Site Description.** The CFA-633 Naval Firing Site and Downrange Area correspond to the Naval Proving Ground (Figure 12-2) established by the U.S. Navy during World War II. CFA-633 was a firing site or “Proof Area,” and the Downrange Area was used as the long-range target area. The gun emplacements for this site were located on the northeast end of CFA, at latitude 43° 32’ 19” north, longitude 112° 56’ 14” west. Elevation at the site is recorded as being 4,935-ft mean sea level (msl). Beginning in November 1943, projectiles were fired at both close and far range. Close-range firings were made into 16-ton concrete blocks that were transported by a 200-ton gantry crane. Long-range firings (distances of up to 47 km [29 mi]) were made toward the northeast. The firing point area comprises 24 ha (60 acres) (Sherwood et al. 1998).

The Naval Proving Ground firing range was a downrange fan extending 48 km (30 mi) to the north and east of the Proof Area firing site. The range was 6.4 km (4 mi) wide at the end adjacent to the gun emplacements and was 9.7 km (6 mi) wide at the downrange end. The downrange end of the range extended nearly to the current location of Idaho Highway 28, approximately 16 km (10 mi) northwest of the town of Mud Lake, Idaho (DOE-ID 1997).

**12.4.1.2 Previous Investigations.** During the 1993 interim action, 8.1 ha (20 acres) immediately northeast of CFA-633 were cleared to a depth of 0.61 m (2 ft). At that time, explosive-contaminated soils were removed from the CFA-633 Naval Firing Site area and shipped to an incinerator, but no live projectiles were found (see map in Sherwood et al. 1998, Appendix H). Minor amounts of soil contamination remained; however, the agency remedial project managers determined that contamination was low enough to allow land farming (Sherwood et al. 1998, Appendix I). In 1995, the area was turned over for land farming of diesel-contaminated soils. The 1993 interim action report for OU 10-05 refers to one previously identified hot spot (228 parts per million [ppm] TNT) that was “below the action level but above the cleanup level” (Sherwood et al. 1998).

A french drain at CFA-633 reportedly has a projectile in the drain. It was determined that the projectile should be left in place. The drain has a concrete cap. The Bechtel BWXT Idaho, LLC (BBWI) Facilities, Utilities, and Maintenance Department has been informed about the problem, and the area has been marked. It is expected that the department will maintain institutional control on this French drain. This decision is documented in the Scope of Work (SOW) (Sherwood et al. 1998, Appendix A).

During the 1996 field assessment, the northern end of the Downrange Area was searched on foot by field crews at approximately 50-m (164-ft) intervals over an area of approximately 518 km<sup>2</sup> (200 mi<sup>2</sup>) (see map in Sherwood et al. 1998, Appendix H). The assessment included visual examination for signs of craters, detonation tests, surface UXO, pieces of explosives, and soil contamination. A total of 14 inert projectiles were located, ranging in size from 20 to 41 cm (8 to 16 in.) (Sherwood et al. 1998). Dispositioning of UXO in the Downrange Area is discussed in Section 12.3.



**Figure 12-2.** Location of CFA-633.

**12.4.1.3 Nature and Extent of Contamination.** All sample results from characterization of the CFA-633 area were for soils collected at 0 to 0.1 m (0 to 4 in.) below grade surface (bgs) and included only nitroaromatic data. Detections included the following:

- 1,3,5-Trinitrobenzene (maximum concentration 0.4 mg/kg), detected in three of six samples
- 2,4,6-TNT, 3.07E+02 mg/kg
- Her Majesty's explosive (HMX), 2.55E+01 mg/kg
- RDX, 1.30E+02 mg/kg.

**12.4.1.4 Preliminary Screening.** The soil data collected from the 1993 and 1994 field sampling efforts were screened for contaminants of potential concern (COPCs). The results of that screen are presented in Table 12-2. The HHRA and ERA screening methodology are discussed in Section 4 and presented in detail in Appendices D and F, respectively. 2,4,6-TNT and RDX were retained as COPCs for the HHRA because the maximum concentrations exceeded the RBCs. 1,3,5-trinitrobenzene, 2,4,6-TNT, HMX, and RDX were retained as COPCs for the ERA because EBSLs have not yet been established for these contaminants.

**12.4.1.5 Risk Assessment.** Table 12-3 presents the exposure point concentrations used in the risk assessment. Appendix C contains both the summary statistics and exposure and exposure point concentrations supporting this assessment.

**12.4.1.6 Human Health.** The estimated human health risk at CFA-633 falls below the target 1E-4 remediation levels for all exposure scenarios and pathways. Table 12-4 presents the carcinogenic risk and noncarcinogenic hazard index summaries for CFA-633.

The total estimated human health risk for all pathways for the 100-year future residential scenario is 3E-06. RDX is the primary contributor to risk through the ingestion of homegrown produce exposure route. RDX presents a 3E-06 risk to future potential residents. The noncarcinogenic hazard index for CFA-633 based on the future residential scenario is 8E-02. Although ingestion of homegrown produce is still the primary exposure route, 2,4,6-TNT presents a greater noncarcinogenic hazard.

The total estimated carcinogenic risk based on the current and future worker scenario is 1E-06. Dermal absorption of TNT is the primary carcinogenic concern in both scenarios. The noncarcinogenic hazard index for both scenarios is 1E-02. Ingestion of soil contaminated with TNT is the primary noncarcinogenic hazard.

**12.4.1.6.1 Ecological—**The COPCs for the ERAs include several explosive compounds for the surface soils. Only COPCs with HQs greater than 10 will be retained for further evaluation in the ERA. These HQs and COPCs are presented in Table 12-5. COPCs with HQs less than or equal to 10 are eliminated from the ERA because they pose a low risk to ecological receptors and no longer need to be evaluated. HQs for 2,4,6-TNT, HMX, and RDX ranged from 1 to 70. Risks from the COPCs to birds, reptiles, amphibians, invertebrates, and plants could not be evaluated because of the lack of toxicity data to develop toxicity reference values.

**Table 12-2.** Soil contaminant screening process for OU 10-04, CFA-633 (1993, 1994).

Table 12-27. Soil contaminant screening process for CS-10-04, C11-000 (1990, 1997).

Detected Contaminants	Source Concentration (mg/kg)	Step 1		Step 2	Step 3		Step 4		Site COPC	
		INEEL Background Concentration (mg/kg)	Max. Concentration > Background	Nontoxic Metal	Region 9/3 RBC (mg/kg)	Max. Concentration > RBC	INEEL EBSL (mg/kg)	Max. Concentration > EBSL	HHRA	ERA
1,3,5-Trinitrobenzene	4.00E-01	NA	NA	No	1.83E+03	No	No EBSL	No EBSL	No	Yes
2,4,6-TNT	3.07E+02	NA	NA	No	1.62E+01	Yes	No EBSL	No EBSL	Yes	Yes
HMX	2.55E+01	NA	NA	No	3.06E+03	No	No EBSL	No EBSL	No	Yes
RDX	1.30E+02	NA	NA	No	4.42E+00	Yes	No EBSL	No EBSL	Yes	Yes

Source: Waste Area Group (WAG) 10, OU 10-04 Database.

"NA" in Step 1 indicates that a background value is not available.

"No RBC" indicates that an Environmental Protection Agency Region 9/3 risk-based concentration based on residential soil ingestion is not available.

"No EBSL" indicates that an INEEL ecologically based screening level is not available.

**Table 12-3.** CFA-633 Exposure Point Concentration Calculations by Bin Depths.

COPC	0-0.5	0-4	0-10
2,4,6-Trinitrotoluene	6.43E+00	8.03E-01	3.21E-01
RDX <sup>a</sup>	1.89E+01	2.37E+00	9.46E-01
1,3,5-trinitrobenzene	4.00E-01	5.00E-02	2.00E-02
HMX	2.55E+01	3.19E+00	1.28E+00

EPC units are mg/kg or pCi/g, bin depths are in feet.

a. Before the EPCs were calculated for the ERA, six samples were removed from the data set, because they were considered "hot spots." See discussion in Appendix F under the results summary for CFA-633. These new EPCs for the ERA are as follows: 6.30E+00 (for 0-0.5 ft), 7.87-01 (for 0-4 ft), and 3.15E-01 (for 0-10 ft).

**Table 12-4.** Human health carcinogenic risk and noncarcinogenic hazard index summary for CFA-633.

COPC	Risk Scenario			Hazard Index Scenario		
	Residential	Current Worker	Future Worker	Residential	Current Worker	Future Worker
2,4,6-TNT	2E-07	4.E-07	4.E-07	1E-1	7.E-03	7.E-03
RDX	1E-05	7.E-07	7.E-07	6E-02	3.E-03	3.E-03
Total Risk/HQ for Scenario	1E-05	1E-06	1E-06	2E-01	1E-02	1E-02

Source: HHRA Spreadsheets. See Appendix E.

**Table 12-5.** Summary of ERA HQs for CFA-633 <sup>a</sup>

COPCs Receptors	2,4,6-TNT HQs	HMX HQs	RDX HQs
Deer mouse	—	2	30 <sup>b</sup>
Mule deer	—	—	1
Pygmy rabbit	2	4	70 <sup>b</sup>

a. COPCs with HQs less than one are not presented in this table.

b. See the bulleted discussion on RDX following this table as to why this HQ is not retained in the ERA.

The HQs for COPCs at CFA-633 Naval Firing Site and Downrange Area are discussed below:

- 1,3,5-Trinitrobenzene HQs at CFA-633 were all below 1.0.
- The only HQ greater than 1 for exposure to 2,4,6-TNT was a 2 for the pygmy rabbit (M122A). The exposure point concentration is 6.43 mg/kg in the surface soil decreasing to 0.32 mg/kg in the subsurface soil. This contaminant was eliminated as a COPC because the HQ fell below 10, which indicates a low risk to ecological receptors.
- The HQs for exposure to HMX ranged from 2 for the deer mouse (M422) to 4 for the pygmy rabbit (M122A). The exposure point concentration is 25.5 mg/kg in the surface soil, decreasing to 1.28 mg/kg in the subsurface soil. This contaminant was eliminated as a COPC because the HQ fell below 10, which indicates a low risk to ecological receptors.
- The HQs for exposure to RDX ranged from 1 for the mule deer (M122) to 30 for the deer mouse (M422) to 70 for the pygmy rabbit (M122A). The exposure point concentration is 6.3 mg/kg in the surface soil, decreasing to 0.32 mg/kg in the subsurface soil. A few samples representing small areas of elevated concentrations were removed from the data set before the exposure point concentrations were calculated. These sample results would have elevated the average risk over the whole area, and the true risk would result in significantly less exposure than modeled. CFA-633 is a highly disturbed area and does not provide

desirable habitat for the pygmy rabbit or deer mouse. Therefore, risk from exposure to RDX contamination is not considered significant (see discussion in Appendix F).

The risk evaluation indicates that CFA-633 has limited risk to ecological receptors from exposure to soils from this area. No COPCs were retained for further evaluation in the ERA for CFA-633. Complete ERA results are presented in Appendix F.

## 12.4.2 Experimental Field Station

**Site Description.** This site is located within the Naval Proving Ground gunnery range approximately 9.7 km (6 mi) downrange and northeast of the CFA-633 Naval Proving Ground firing site, and approximately 0.4 km (0.25 mi) west of the Big Lost River channel (see Figure 12-3). The site encompasses 556.5 ha (1,375 acres) and includes multiple craters within which a variety of explosive-tests were conducted. The site is known to contain UXO, pieces of explosives, structural debris, and soil contamination (DOE-ID 1999b).

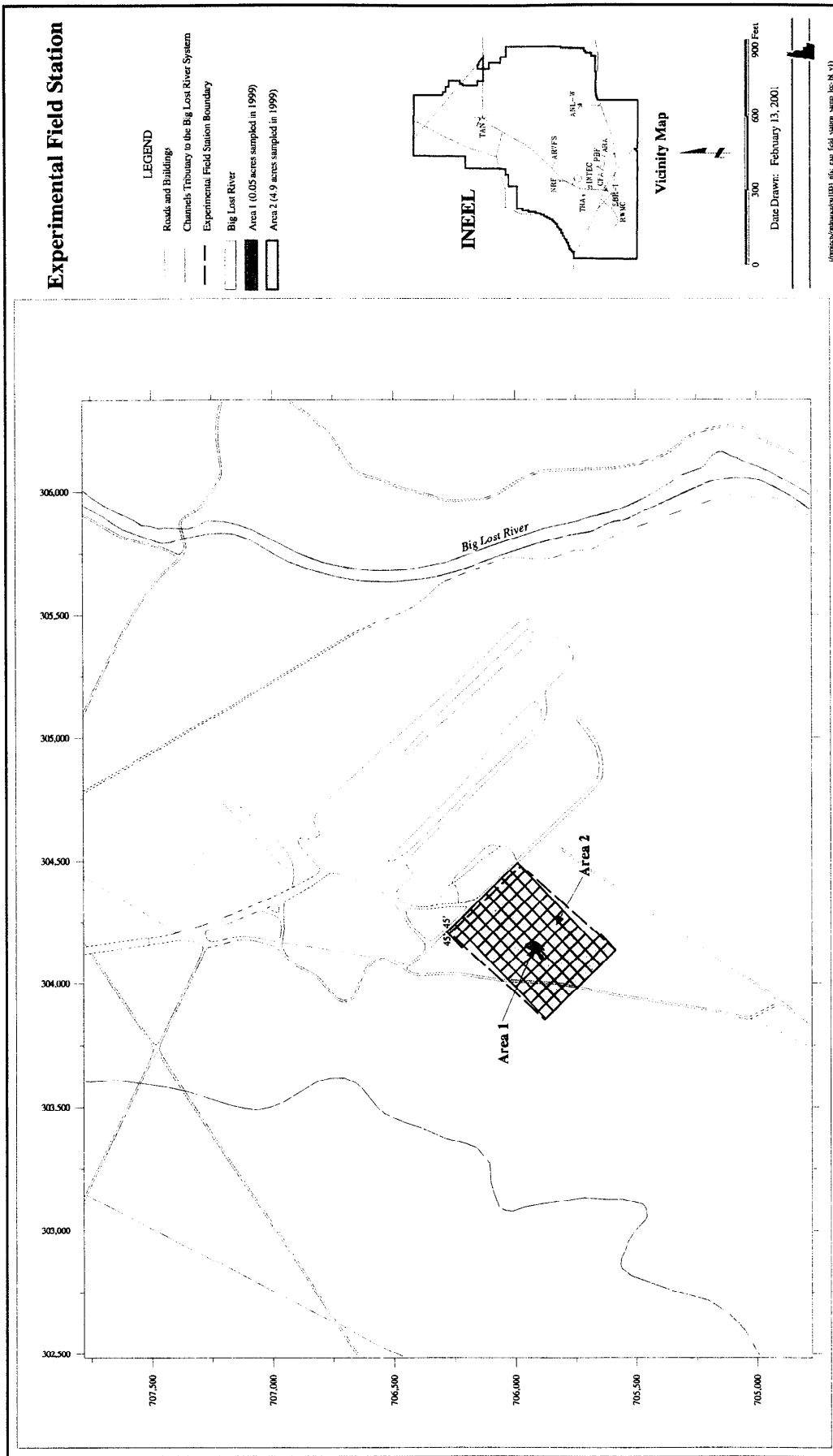
**12.4.2.1 Nature and Extent of Contamination.** Maximum detected contamination levels are listed below for all contaminants. All contamination occurs at 0 to 0.61 m (0 to 2 ft) bgs.

- 1,3,5-trinitrobenzene 8.00E+01 mg/kg
- 1,3-dinitrobenzene 8.80E-01 mg/kg
- 2,4,6-TNT 1.10E+03 mg/kg
- 4-amino-2,6-dinitrotoluene 8.00E+00 mg/kg
- Nitrate 5.30E+02 mg/kg
- Nitrite 9.20E+01 mg/kg.

**12.4.2.2 Preliminary Screening.** The soil data collected from the 1999 field sampling effort were screened for COPCs. The results of that screening are presented in Table 12-6. The HHRA and ERA screening methodologies are discussed in Section 4 and presented in detail in Appendices D and F, respectively. 2,4,6-TNT and 4-amino-2,6-dinitrotoluene were retained as COPCs for the HHRA because the maximum concentrations exceeded the RBC. 1,3 dinitrobenzene and nitrate were retained as COPCs for the ERA because the maximum concentrations exceeded the EBSLs. 1,3,5-Trinitrobenzene, 2,4,6-TNT, amino-2,6-dinitrotoluene, and nitrite were retained as COPCs for the ERA because EBSLs have not yet been established for these contaminants.

**12.4.2.3 Risk Assessment.** Table 12-7 presents the exposure point concentrations used in the baseline risk assessment. Appendix C contains both the summary statistics and exposure point concentrations supporting this assessment.

**12.4.2.3.1 Human Health—**The estimated human health risk at the Experimental Field Station is less than 1E-04 and is within the target risk range for all exposure scenarios and pathways. The noncarcinogenic human health hazard index for the future residential scenario is 10. This hazard index is above the target remediation level for noncarcinogenic hazards. Table 12-8 below presents the carcinogenic risk and noncarcinogenic hazard index summaries for the Experimental Field Station.



**Figure 12-3.** Location of Experimental Field Station.

**Table 12-6.** Soil contaminant screening process for Experimental Field Station.

Detected Contaminants	Step 1			Step 2	Step 3		Step 4		Site COPC	
	Max. Source Concentration (mg/kg)	INEEL Background Concentration (mg/kg)	Max. Concentration > Background	Nontoxic Metal	Region 9/3 RBC (mg/kg)	Max. Concentration > RBC	INEEL EBSL (mg/kg)	Max. Concentration > EBSL	HHRA	ERA
<b><u>Area 1</u></b>										
1,3,5-Trinitrobenzene	8.00E+01	NA	NA	No	1.83E+03	No	No EBSL	No EBSL	No	Yes
1,3-Dinitrobenzene	8.80E-01	NA	NA	No	6.11E+00	No	7.82E-02	Yes	No	Yes
2,4,6-TNT	1.10E+03	NA	NA	No	1.62E+01	Yes	No EBSL	No EBSL	Yes	Yes
2,4-Dinitrotoluene	3.20E-01	NA	NA	No	1.22E+02	No	1.54E+00	No	No	No
4-Amino-2,6-Dinitrotoluene	8.00E+00	NA	NA	No	4.70E+00	Yes	No EBSL	No EBSL	Yes	Yes
Nitrate	5.30E+02	NA	NA	No	1.25E+05	No	1.84E+01	Yes	No	Yes
Nitrite	8.80E+01	NA	NA	No	7.82E+03	No	No EBSL	No EBSL	No	Yes
<b><u>Area 2</u></b>										
Nitrate	2.60E+02	NA	NA	No	1.25E+05	No	1.84E+01	Yes	No	Yes
Nitrite	9.20E+01	NA	NA	No	7.82E+03	No	No EBSL	No EBSL	No	Yes

Source: WAG 10, OU 10-04 Database.

"NA" in Step 1 indicates that a background value is not available.

"No RBC" indicates that an Environmental Protection Agency Region 9/3 risk-based concentration based on residential soil ingestion is not available.

"No EBSL" indicates that an INEEL ecologically based screening level is not available.



**Table 12-7. Experimental Field Station Exposure Point Concentrations by Bin Depths.**

COPC	0-0.5	0-4	0-10
<i>Area 1</i>			
1,3,5-Trinitrobenzene	8.00E+01	1.53E+01	6.10E+00
1,3-Dinitrobenzene	1.40E+01	2.52E+00	1.01E+00
2,4,6-Trinitrotoluene	1.10E+03	1.42E+02	5.67E+01
4-Amino-2,6-Dinitrotoluene	1.40E+01	1.88E+00	7.51E-01
Nitrate	4.06E+02	2.96E+02	1.18E+02
Nitrite	8.27E+01	6.46E+01	2.58E+01
<i>Area 2</i>			
Nitrate	2.46E+02	2.23E+02	8.93E+01
Nitrite	8.14E+01	7.40E+01	2.96E+01

EPC units are mg/kg or pCi/g; bin depths are in feet.

**Table 12-8.** Human health carcinogenic risk and noncarcinogenic hazard index summary for Experimental Field Station.

COPC	Risk Scenario			Hazard Index Scenario		
	Residential	Current Worker	Future Worker	Residential	Current Worker	Future Worker
2,4,6-TNT	9E-05	6E-05	6E-05	1E+01	1E+00	1E+00
4-Amino-2,6-Dinitrotoluene	NTD	NTD	NTD	NTD	NTD	NTD
Total Risk/HQ for Scenario	9E-05	6E-05	6E-05	1E+01	1E+00	1E+00

Source: HHRA Spreadsheets. See Appendix E.

NTD: No toxicological health risk values are currently available for 4-amino-2,6-dinitrotoluene; therefore, this COPC will be addressed further in the uncertainty section below (Section 12.5). The toxicity profile for 4-amino-2, 6-dinitrotoluene is located in Appendix D, Attachment D1.

The total estimated human health risk to potential future residents at the Experimental Field Station for all exposure routes is 9E-05. This risk is primarily from exposure to TNT through ingestion of homegrown produce. Total noncarcinogenic hazard to future residents is 10. The primary exposure route for noncarcinogenic hazards is ingestion of homegrown produce.

The total estimated risk to current and future occupational workers is 6E-5 from TNT contamination. This risk is primarily from the dermal absorption of soil exposure route. Total noncarcinogenic hazard to future workers is 1. This hazard index (HI) falls within the target remediation levels.

**12.4.2.3.2 Ecological**—Ecological risks at the Experimental Field Station area were characterized by dividing the site into two areas. Area 1 contained large chunks of TNT, heavy soil staining, and boxes of TNT that had degraded and had begun to stain the surrounding soil. Area 2 was contaminated, but to a much lesser degree. Dividing the site allows for focusing on the areas where specific contaminants were found, potentially limiting the area requiring remediation, and, therefore, reducing unnecessary destruction of habitat. The COPCs for the ERA include several inorganic and explosive compounds for the surface and subsurface soils. Only COPCs with HQs greater than 10 will be retained for further evaluation in the ERA. These COPCs and HQs are presented in Table 12-9. COPCs with HQs less than or equal to 10 are eliminated from the ERA because they pose a low risk to ecological receptors and no longer need to be evaluated. HQs from the contaminants at this site ranged from 1 to 300. Risks from these contaminants to reptiles, amphibians, and invertebrates could not be evaluated because of the lack of toxicity data to develop toxicity reference values. Also, a few of the COPCs for this site could not be assessed for ecological risk because of the lack of toxicity information. The remaining COPCs are discussed in greater detail under their designated area.

#### Area 1

HQs for the COPCs from this area ranged from 1 to 300. Risks to birds and plants could not be assessed for threats from exposure to chloride and 4-amino-2,6-dinitrotoluene. Furthermore, risk to plants could not be assessed for nitrate and nitrite. 4-amino-2,6-dinitrotoluene is a breakdown component of 2,4,6-TNT; therefore, if 2,4,6-TNT is present above risk-based levels, then it is assumed that 4-amino-2,6-dinitrotoluene is also present and may pose a risk to ecological receptors.

**Table 12-9.** Summary of ERA HQs for the Experimental Field Station <sup>a</sup>

COPCs Receptors	1,3,5-trinitrobenzene HQs	1,3-dinitrobenzene HQs	2,4,6-TNT HQs	Nitrate HQs	Nitrite HQs
<b><u>Area 1</u></b>					
Deer mouse	1	30	200	3	—
Pygmy rabbit	2	80	300	3	—
<b><u>Area 2</u></b>					
Black-billed magpie	—	—	—	1	—
Deer mouse	—	—	—	2	—
Loggerhead shrike	—	—	—	3	1
Mourning dove	—	—	—	2	—
Pygmy rabbit	—	—	—	2	—
Sage sparrow	—	—	—	4	1
Townsend's western big-eared bat	—	—	—	3	1

a. COPCs with HQs less than one are not presented in this table.

The HQs for the COPCs at the Experimental Field Station Area 1 are discussed below:

- The HQs for exposure to 1,3,5-trinitrobenzene ranged from 1 for the deer mouse (M422) to 2 for the pygmy rabbit (M122A). The exposure point concentration in the surface soil is 80 mg/kg, decreasing to 15.3 mg/kg in the subsurface soil. This contaminant had HQs below 10, which indicates a low risk to ecological receptors.
- The HQs for exposure to 1,3-dinitrobenzene ranged from 30 for the deer mouse (M422) to 80 for the pygmy rabbit (M122A). The exposure point concentration in the surface soil is 14 mg/kg, decreasing to 1.01 mg/kg in the subsurface soil. This contaminant is above the low risk HQ of 10 for the deer mouse and pygmy rabbit.
- The HQs for exposure to 2,4,6-TNT ranged from 200 for the deer mouse (M422) to 300 for the pygmy rabbit (M122A). The exposure point concentration in the surface soil is 1,100 mg/kg, decreasing to 56.7 mg/kg in the subsurface soil. This contaminant is above the low risk HQ of 10 for the pygmy rabbit.
- The HQs for exposure to 4-amino-2,6-dinitrotoluene ranged from 1 for the deer mouse (M422) to 2 for the pygmy rabbit (M122A). The exposure point concentration in the surface soil is 8 mg/kg. This contaminant had HQs below 10, which indicates a low risk to ecological receptors.
- The only HQ greater than 1 for exposure to nitrate was a 3 for the pygmy rabbit (M122A) and deer mouse (M422). The exposure point concentration in the surface soil is 406 mg/kg,

decreasing to 118 mg/kg in the subsurface soil. The INEEL background value for nitrate has been neither evaluated nor made available at this time. This contaminant has HQs below 10, which indicates a low risk to ecological receptors.

- Nitrite HQs at the Experimental Field Station Study Area 1 were all below 1.0. Toxicity reference values from nitrate were used to evaluate this COPC because of their similar characteristics and properties. Toxicity reference values for nitrite could not be developed because of the lack of toxicity data.

The risk evaluation indicates that Experimental Field Station Area 1 has risk to ecological receptors from exposure to 1,3-dinitrobenzene and 2,4,6-TNT.

## Area 2

Hazard quotients for the COPCs from this area ranged from 1 to 30. Risks to plants could not be assessed from exposure to nitrate and nitrite.

The HQs for the COPCs at the Experimental Field Station Area 2 are discussed below.

- The HQs for exposure to nitrate ranged from 1 for the loggerhead shrike (AV322), to 2 for the pygmy rabbit (M122A) and deer mouse (M422), 3 for the Townsend's western big-eared bat, and 4 for the sage sparrow (AV222). The exposure point concentration in the surface soil is 246 mg/kg, decreasing to 89.3 mg/kg in the subsurface soil. The INEEL background value for nitrate has been neither evaluated nor made available at this time. This contaminant was eliminated as a COPC because the HQs fell below 10, which indicates a low risk to ecological receptors.
- The only HQ greater than 1 for exposure to nitrite was a 1 for the sage sparrow (AV222). The exposure point concentration in the surface soil is 81.4 mg/kg, decreasing to 29.6 mg/kg in the subsurface soil. The INEEL background value for nitrite has been neither evaluated nor made available at this time. Toxicity reference values from nitrate were used to evaluate this COPC because of their similar characteristics and properties. Toxicity reference values for nitrite could not be developed because of the lack of toxicity data. This contaminant was eliminated as a COPC because the HQs fell below 10, which indicates a low risk to ecological receptors.

The risk evaluation indicates that the Experimental Field Station has limited risk to ecological receptors from exposure to soils from this area. In summary, based on dose and HQ calculations and background comparisons, the primary ecological contaminants at the Experimental Field Station include 1,3-dinitrobenzene and 2,4,6-TNT (at Area 1) in soil. Complete ERA results are presented in Appendix F.

### **12.4.3 Burn Ring South of Experimental Field Station**

**12.4.3.1 Site Description.** This site consists of the area contained within a round, metal containment barrier or ring approximately 15 cm (6 in.) in height and approximately 3 to 4.6 m (10 to 15 ft) in diameter. The site resembles a campfire ring or pit. The ring is located approximately 9.7 km (6 mi) northeast of the CFA-633 Naval Proving Ground firing site and is adjacent to the two most southern concrete revetment walls located between the Experimental Field Station and the Big Lost River channel (see Figure 12-4). No documentation of this site has been found, but it is suspected of having been used as a smoke generator or an illumination marker for nighttime gunnery activities associated with the concrete revetment walls. Wire coils and burn residues similar to those left following the burning of

**Figure 12-4.** Location of Burn Ring South of Experimental Field Station.

old tires were found within the metal ring. It had been reported that heavily contaminated soils existed in this area (DOE-ID 1997).

**12.4.3.2 Previous Investigations.** This area was surveyed in 1995, during a facilities and maintenance action. No ordnance, pieces of explosives, or explosives soil contamination were found. During the 1996 field assessment, no samples were collected from this site because no sign of TNT or RDX contamination was evident (DOE-ID 1997).

In 1999, two composite samples were collected from the surface and two from the subsurface of the burn ring, as described in the *Field Sampling Plan (FSP) for Operable Unit (OU) 10-04 Explosive Compounds* (DOE-ID 1999b). Summary statistics for soil samples collected at this location are provided in Appendix C.

**12.4.3.3 Nature and Extent of Contamination.** All analytical results were obtained from surface and subsurface soil at 0 to 0.61 m (0 to 2 ft) bgs. The maximum concentration of 4-chloro-5-methylphenol is low and represents a single detect in five sample results, including one field duplicate. Bromomethane and trichlorofluoromethane maximum concentrations are also at low levels, and they are volatile. The maximum arsenic concentration (7 mg/kg) is just above the INEEL background value (5.8 mg/kg). There were three other arsenic values slightly above background, and one value was just below background. All arsenic-detected concentrations are within the regional background ranges discussed in Appendix K. Bis(2-ethylhexyl)phthalate was detected in three of five samples, with a maximum concentration of 0.19 mg/kg. Bromomethane was detected in one of three valid sample results, and trichlorofluoromethane was detected in one of five sample results. Both compounds are volatiles. Chloride results were available for four samples, ranging from 77 to 93 mg/kg. The maximum value for chromium (37.5 mg/kg) just slightly exceeded the INEEL background value (33 mg/kg), and the other four values were at or below background. The maximum value for cobalt (11.2 mg/kg) only slightly exceeded the INEEL background value (11.0 mg/kg) and exceeded the ecologically based screening level. Copper concentrations ranged from 24.4 to 37.1 mg/kg compared to background (22 mg/kg). Fluoride concentrations ranged from 180 to 230 mg/kg; however, no background value was available for comparison. The maximum lead concentration (25.1 mg/kg) is somewhat elevated above background (17 mg/kg). The second highest value (24.3 mg/kg) was also slightly elevated, and the other two lead values were below background. All but one nickel value were just above background (35 mg/kg), with a maximum concentration at 38.6 mg/kg. Three of five zinc values (2,090 to 2710 mg/kg) are substantially above background (150 mg/kg). These high results were surface samples at 0–0.08 ft; whereas, the remaining two subsurface (0.17–2 ft) soil concentrations (186 to 172 mg/kg) were only somewhat higher than background. Anion data for this site include nitrate, nitrite, and sulfate; no background results are available for comparison. Nitrate concentrations ranged from 190 to 340 mg/kg. Nitrite concentrations ranged from 40 to 87 mg/kg. Three of five sulfate values (1,000 to 1,200 mg/kg) are much higher than the remaining two values (420 and 260 mg/kg). These high sulfate results were also associated with surface soil (0 to 0.08 ft). Based on the available sample results, there appears to be zinc and sulfate contamination in surface soil and very low residual organic contamination. The other metals appear to be within a reasonable margin of error for environmental data when compared to background.

**12.4.3.4 Preliminary Screening.** The soil data collected from the 1999 field sampling were screened for COPCs. The results of that screen are presented in Table 12-10. The HHRA and ERA screening methodology are discussed in Section 4 and presented in detail in Appendices D and F, respectively. 4-chloro-3-methylphenol was the only COPC identified for the HHRA because an RBC has not yet been established for this contaminant. Bromomethane, nitrite, and trichlorofluoromethane were retained as COPCs for the ERA because EBSLs have not yet been established for these contaminants. Chromium, cobalt, copper, lead, nickel, nitrate, and zinc were retained as COPCs for the ERA because the maximum concentrations exceeded the EBSLs.

**12.4.3.5 Risk Assessment.** Insufficient toxicological data exists for 4-chloro-3-methylphenol. Therefore, this COPC was carried forward in the HHRA, but could not be evaluated for potential carcinogenic risk or noncarcinogenic hazards. A more qualitative discussion of the toxicity of 4-chloro-3-methylphenol can be found in Appendix D, Attachment D1. This COPC will be addressed further in the uncertainty section below (Section 12.5).

Arsenic was removed from the HHRA COPC list because levels were comparable to regional background ranges (see discussion in Appendix K). No HHRA was performed for this area.

**12.4.3.5.1 Ecological**—Table 12-11 presents the exposure point concentrations used in the baseline risk assessment. Appendix C contains both the summary statistics and exposure point concentrations supporting this assessment. The COPCs for the ERA include several inorganic and explosive compounds for the surface and subsurface soils. Only COPCs with HQs greater than 10 will be retained for further evaluation in the ERA. These COPCs and HQs are presented in Table 12-12. COPCs with HQs less than or equal to 10 are eliminated from the ERA because they pose a low risk to ecological receptors. HQs from the contaminants at this site ranged from 1 to 80. Risks from the COPCs to reptiles, amphibians, and invertebrates could not be evaluated because of the lack of toxicity data to develop toxicity reference values. Furthermore, risk to plants could not be assessed for cobalt, nitrate, and nitrite. Bromomethane and trichlorofluoromethane were among these COPCs, but no toxicity information could be found to assess ecological risk. Background concentrations are included in Table 12-10 for comparison to maximum detected concentrations of these contaminants. Note that there is no set limit or percentage above background that determines if the contaminant poses a risk.

The HQs for the COPCs at the Burn Ring area are discussed below.

- The only HQ greater than 1 for exposure to chromium was a 7 for the plants (all vegetation). The exposure point concentration in the surface soil is 37.5 mg/kg, decreasing to 15 mg/kg in the subsurface soil. The INEEL background concentration for chromium is 33 mg/kg. Therefore, an average species may be exposed to the same magnitude of risk from exposure to background. This contaminant was eliminated as a COPC because the HQs fell below 10, which indicates a low risk to ecological receptors.
- The only HQ greater than 1 for exposure to cobalt was a 5 for the pygmy rabbit (M122A). The exposure point concentration in the surface soil is 11.1 mg/kg, decreasing to 4.5 mg/kg in the subsurface soil. The INEEL background concentration for cobalt is 11 mg/kg. Therefore, an average species may be exposed to the same magnitude of risk from exposure to background. This contaminant was eliminated as a COPC because the HQs fell below 10, which indicates a low risk to ecological receptors.
- The only HQ greater than 1 for exposure to copper was a 3 for the pygmy rabbit (M122A). The exposure point concentration in the surface soil is 37.1 mg/kg, decreasing to 11.1 mg/kg in the subsurface soil. The INEEL background concentration for copper is 22 mg/kg. This contaminant was eliminated as a COPC because the HQs fell below 10, which indicates a low risk to ecological receptors.
- Lead HQs at the burn ring area were all below 1.0.
- Nickel HQs at the burn ring area were all below 1.0.

**Table 12-10.** Soil contaminant screening process for WAG 10, OU 10-03, Burn Area South of Experimental Field Station (1999).

Detected Contaminants	Step 1			Step 2	Step 3	Step 4			Site COPC	
	Max. Source Concentration (mg/kg)	INEEL Background Concentration (mg/kg)	Max. Concentration > Background	Nontoxic Metal	Region 9/3 RBC (mg/kg)	Max. Concentration > RBC	INEEL EBSL (mg/kg)	Max. Concentration > EBSL	HHRA	ERA
4-Chloro-3-methylphenol	4.00E-02	NA	NA	No	NO RBC	No RBC	1.80E+01	No	Yes	No
Bromomethane	1.20E-02	NA	NA	No	3.90E+00	No	No EBSL	No EBSL	No	Yes
Chromium	3.75E+01	3.30E+01	Yes	No	2.10E+02	No	1.00E+00	Yes	No	Yes
Cobalt	1.12E+01	1.10E+01	Yes	No	4.69E+03	No	4.27E-01	Yes	No	Yes
Copper	3.71E+01	2.20E+01	Yes	No	2.90E+03	No	2.11E+00	Yes	No	Yes
Lead	2.51E+01	1.70E+01	Yes	No	4.00E+02	No	9.94E-01	Yes	No	Yes
Nickel	3.86E+01	3.50E+01	Yes	No	1.56E+03	No	3.00E+01	Yes	No	Yes
Nitrate	3.40E+02	NA	NA	No	1.25E+05	No	1.84E+01	Yes	No	Yes
Nitrite	8.70E+01	NA	NA	No	7.82E+03	No	No EBSL	No EBSL	No	Yes
Trichlorofluoromethane	2.00E-03	NA	NA	No	3.86E+02	No	No EBSL	No EBSL	No	Yes
<u>Zinc</u>	<u>2.71E+03</u>	<u>1.50E+02</u>	<u>Yes</u>	<u>No</u>	<u>2.35E+04</u>	<u>No</u>	<u>3.29E+00</u>	<u>Yes</u>	<u>No</u>	<u>Yes</u>

Source: WAG 10, OU 10-04 Database.

"NA" in Step 1 indicates that a background value is not available.

"No RBC" indicates that an EPA Region 9 or 3 RBC based on residential soil ingestion is not available.

"No EBSL" indicates that an INEEL ecologically based screening level is not available.

Arsenic was removed from the ERA and HHRA COPC lists because detected levels are within the arsenic regional background ranges discussed in Appendix K.



**Table 12-11. Burn Ring Exposure Point Concentration Calculations by Bin Depths.**

COPC	0-0.5	0-4	0-10
4-Chloro-3-methylphenol	1.85E-01	1.85E-01	7.40E-02
Bromomethane	1.20E-02	1.20E-02	4.80E-03
Chromium	3.75E+01	3.75E+01	1.50E+01
Cobalt	1.11E+01	1.12E+01	4.47E+00
Copper	3.71E+01	2.77E+01	1.11E+01
Lead	2.44E+01	1.71E+01	6.82E+00
Nickel	3.85E+01	3.86E+01	1.54E+01
Nitrate	3.10E+02	2.66E+02	1.07E+02
Nitrite	7.60E+01	6.20E+01	2.48E+01
Trichlorofluoromethane	5.50E-03	5.94E-03	2.38E-03
Zinc	2.71E+03	5.02E+02	2.01E+02

EPC units are mg/kg or pCi/g; bin depths are in feet.

**Table 12-12.** Summary of ERA HQs for Burn Ring South of Experimental Field Station <sup>a</sup>

COPCs Receptors	Chromium HQs	Cobalt HQs	Copper HQs	Nitrate HQs	Zinc HQs
Deer mouse	—	—	—	—	2
Plants	7	—	—	—	80 <sup>b</sup>
Pygmy rabbit	—	5	3	1	20 <sup>b</sup>

a. COPCs with HQs less than one are not presented in this table.

b. See the bulleted discussion of zinc below as to why this contaminant was not retained in the ERA.

- The only HQ greater than 1 for exposure to nitrate was a 1 for the pygmy rabbit (M122A). The exposure point concentration in the surface soil is 310 mg/kg, decreasing to 107 mg/kg in the subsurface soil. The INEEL background value for nitrate has been neither evaluated nor made available at this time. This contaminant was eliminated as a COPC because the HQs fell below 10, which indicates a low risk to ecological receptors.
- Nitrite HQs at the burn ring area were all below 1.0. Toxicity reference values from nitrate were used to evaluate this COPC because of their similar characteristics and properties. Toxicity reference values for nitrite could not be developed because of the lack of toxicity data.
- The HQs for exposure to zinc ranged from 2 for the deer mouse (M422) to 20 for the pygmy rabbit (M122A) to 80 for the plants (all vegetation). The exposure point concentration in the surface soil is 2,710 mg/kg, decreasing to 201 mg/kg in the subsurface soil. The INEEL background concentration for zinc is 150 mg/kg. Only two ecological receptors show risk from Zinc with HQs above 10; these include plants and the pygmy rabbit. Zinc is the only COPC at this site presenting any potential for risk. Zinc is found naturally in the environment and is present in all foods (ATSDR 1998). Zinc is likely to be strongly sorbed to soil, and relatively little land disposed zinc is expected to be in a soluble form (DOE-ID 1999). This contaminant is unlikely to pose an unacceptable risk to ecological receptors because of the conservativeness in the ERA modeling and should not be considered a COPC at this site.

The risk evaluation indicates that the Burn Ring has limited risk to ecological receptors from exposure to soil at this site. There is some potential risk to zinc, but this will be assessed in the OU 10-04 site-wide ERA. The risk from UXO to ecological receptors is considered low. Complete ERA results are presented in Appendix F.

#### 12.4.4 Land Mine and Fuze Burn Area

**12.4.4.1 Site Description.** The site is 0.8 km (0.5 mi) west of Lincoln Boulevard and approximately 0.8 km (0.5 mi) north of the Fire Station II training area (Mile Marker 5) (Figure 12-5). The site consists of approximately five separate ordnance disposal locations in a 8.1-ha (20-acre) area between a meander of a former channel of the Big Lost River and an old abandoned irrigation canal that was hand dug in the early 1900s. The site was used by Naval Proving Ground personnel for disposal of land mine pressure plates and aerial bomb packaging materials and as an area to dispose of land mine fuses by burning (DOE-ID 1997).

**12.4.4.2 Preliminary Screening.** The soil data collected from the 1999 field sampling were screened for COPCs. The results of that screen are presented in Table 12-13. The HHRA and ERA screening methodology are discussed in Section 4 and presented in detail in Appendices D and F, respectively.

#### Area 2

No COPCs were retained as COPCs for the HHRA. 2,4,6-TNT was retained as a COPC for the ERA because the EBSL has not yet been established for this contaminant. 2,6-dinitrotoluene, lead, nitrate, and selenium were retained for the ERA because the maximum concentrations exceeded the RBCs.

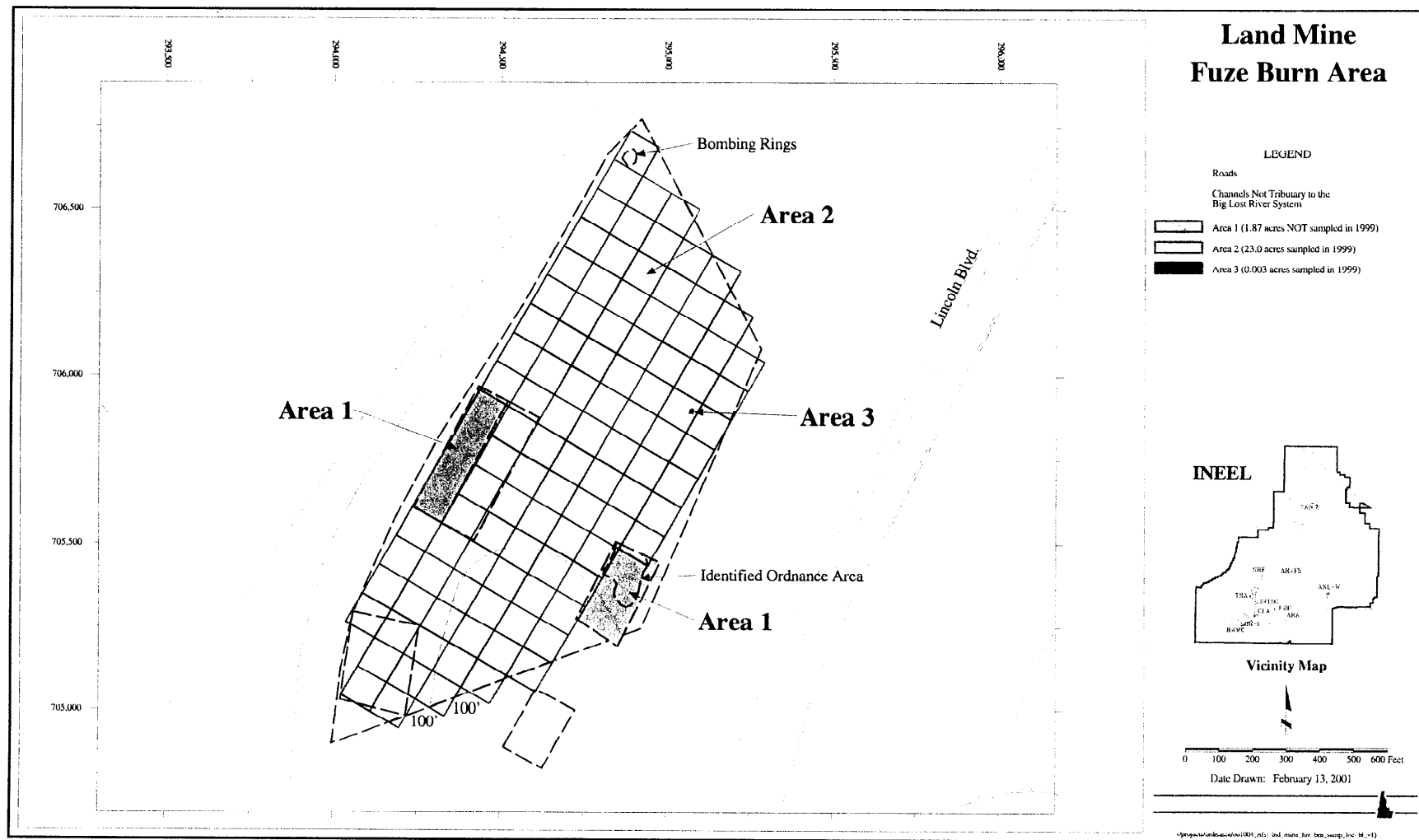
#### Area 3

Only 2,4,6-TNT was retained as an HHRA COPC. This is because the maximum concentration exceeded the RBC. 2,4,6-TNT and TPH-diesel were retained as COPCs for the ERA because EBSLs have not yet been established for these contaminants. 1,3-dinitrobenzene, 2,4-dinitrotoluene, nitrate, and zinc were retained for the ERA because the maximum concentrations exceeded the RBCs.

**12.4.4.3 Nature and Extent of Contamination.** The Mine Fuze soils site was considered to represent two separate areas of contamination.

Maximum detected contamination levels are listed below for all HHRA and ERA COPCs. All contamination occurs at 0 to 0.61 m (0 to 2 ft) bgs.

• 1,3-Dinitrobenzene	4.20E-01 mg/kg
• 2,4,6-TNT	7.90E+04 mg/kg
• 2,4-Dinitrotoluene	1.40E+01 mg/kg
• 2,6-Dinitrotoluene	7.30E+00 mg/kg
• Lead	1.73E+01 mg/kg
• Nitrate	1.60E+03 mg/kg
• Selenium	2.20E+00 mg/kg
• TPH-diesel	2.70E+02 mg/kg
• Zinc	7.46E+02 mg/kg.



**Figure 12-5.** Location of Land Mine and Fuze Burn Area.

**Table 12-13.** Soil contaminant screening process for OU 10-04, Land Mine and Fuze Burn Area (1999).

Environmental Monitoring Process for CS-10-0-1, Lake Naim and Lake Sam'ara (1999)											
Detected Contaminants	Max. Source Concentration (mg/kg)	Step 1		Step 2		Step 3		Step 4		Site COPC	
		INEEL Background Concentration (mg/kg)	Max. Concentration > Background	Nontoxic Metal	Region 9/3 RBC (mg/kg)	Max. Concentration > RBC	INEEL EBSL (mg/kg)	Max. Concentration > EBSL	HHRA	ERA	
<b><u>Area 2</u></b>											
Area 2											
2,4,6-TNT	2.20E+00	NA	NA	No	1.62E+01	No	No EBSL	No EBSL	No	Yes	
2,6-Dinitrotoluene	7.30E+00	NA	NA	No	6.11E+01	No	2.18E+00	Yes	No	Yes	
Lead	1.73E+01	1.70E+01	Yes	No	4.00E+02	No	9.94E-01	Yes	No	Yes	
Nitrate	2.40E+02	NA	NA	No	1.25E+05	No	1.84E+01	Yes	No	Yes	
Selenium	2.20E+00	2.20E-01	Yes	No	3.91E+02	No	1.72E-01	Yes	No	Yes	
1,3-Dinitrobenzene	4.20E-01	NA	NA	No	6.11E+00	No	7.82E-02	Yes	No	Yes	
Area 3											
2,4,6-TNT	7.90E+04	NA	NA	No	1.62E+01	Yes	No EBSL	No EBSL	Yes	Yes	
2,4-Dinitrotoluene	1.40E+01	NA	NA	No	1.22E+02	No	1.54E+00	Yes	No	Yes	
Nitrate	1.60E+03	NA	NA	No	1.25E+05	No	1.84E+01	Yes	No	Yes	
TPH-diesel	2.70E+02	NA	NA	No	1.00E+03	No	No EBSL	No EBSL	No	Yes	
Zinc	7.46E+02	1.50E+02	Yes	No	2.35E+04	No	3.29E+00	Yes	No	Yes	

Source: WAG 10, OU 10-04 Database.

"NA" in Step 1 indicates that a background value is not available.

"No RBC" indicates that an EPA Region 9 or 3 RBC based on residential soil ingestion is not available.

"No EBSL" indicates that an INEEL ecologically based screening level is not available.

Arsenic was removed from the ERA and HHRA COPC lists because detected levels are within the arsenic regional background ranges discussed in Appendix K.